

201.00 CLEARING AND GRUBBING**General**

Clearing and grubbing, depending on the contract, may be measured by the acre or on a lump sum basis. Generally, staking of areas to be cleared and grubbed is necessary only when measurement is specified by the acre. However, special circumstances may require staking of this item even when measurement is on a lump sum basis. Remeasuring of this item is not normally required.

Staking areas to be cleared and grubbed should, if practical, be done during slope staking. This may not be practical on projects or portions of projects where heavy or extensive clearing operations will be required. When this situation is encountered, it will be necessary to set stakes from the "design" cross-sections or from computer printouts, if available. Regardless of which method is used, survey notes of sufficient detail are required in order that pay quantities can be accurately determined.

The format of the notes and the method of staking should be discussed with the engineer before the staking is started. Normally lath will be set at the clearing and grubbing line with a specific color of flagging attached for easy identification.

If the entire project does not require clearing, staking; clearing; and grubbing should be based upon the specifications and areas shown on the plans. Areas clear of vegetation, of low growth, or of negligible or sparse vegetation should be excluded from measurement.

The contractor cannot be expected to clear and grub or otherwise provide special treatment to vegetation in areas not included in the measurement. Where there is the possibility of a dispute between the contractor and the engineer as to which areas should be included in the measurement for payment, the value of meaningful photographs should not be overlooked. In cases of dispute when measurement is by documentation. The inspector should review the areas of clearing and grubbing with the contractor's representative to avoid any misunderstanding as to the areas and limits.

There are some additional staking problems not necessarily involved in the measurement of this item of work but which should be given consideration as they relate to the clearing and grubbing operation. It may be advisable to stake right-of-way lines at the same time clearing and grubbing is staked to avoid having the contractor encroaching on private property. Centerline reference points should be located outside the limits of clearing and grubbing, if practical. Centerline control points are less likely to be destroyed by clearing equipment if they are set with firmly driven iron pins and are well marked.

The importance of providing an adequate inspection force for the clearing and grubbing work should not be slighted. Inspection records should provide sufficiently detailed documentation of the work; so that in case of disputes, a basis for an adjusted price could be accurately determined. The inspector's records are normally not used for computing final pay quantities but are used to verify the activity. They can be used to advantage, however, to document-estimated quantities or percent of total quantity for the purpose of progress payments. Inspection records may provide source data for small areas of clearing and grubbing due to a slope revision or for other reasons not foreseen when the original staking was accomplished.

Documenting in the diary that clearing and grubbing conforms to stakes eliminates the need for remeasure and is considered a good practice.

The inspector assigned to the clearing and grubbing work should be familiar with all the staking and surveys within the areas involving clearing and grubbing. He can, thereby, see that the contractor protects survey control points and control reference points, benchmarks, slope stakes, etc.

Any damage to or trespassing on private property by the contractor or any undue damage to vegetation outside the staked clearing and grubbing limits should be brought to the contractor's attention immediately and a record made of it by the inspector.

With the increased emphasis on beautification and new laws relating to the control of junkyards and dumps, attention must be given to the disposal of debris from clearing and grubbing. Disposal areas must be carefully selected to comply with specifications.

When utility facilities may interfere with the contractor's operations, the inspector should immediately notify the engineer of the situation. It is recommended that the engineer promote a meeting between the utility company and the contractor to resolve the problems and prepare a written report. The inspector should keep such additional records as may be required to substantiate or refute claims for delay.

The office man, under the direction of the engineer, is normally responsible for reducing the field notes, checking and making computations, recording progress estimate and final quantities in the ledger.

A number of acceptable methods are available for computing areas of clearing and grubbing where payment is on the acre basis. The method used will depend to a great extent on the method of staking and the survey note format. Where traverses are used, a computer program is available for area computations.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work. Preliminary cross-sections or computer printouts may be used to stake the limits when clearing and grubbing must precede slope staking. When so used, they become source documents.

When conditions permit, clearing and grubbing limits may be set at the time of slope staking. In this case, the slope stake notes become the source documents. Clearing and grubbing areas need not be remeasured providing they are cleared as staked and so noted in the diary.

Field measurements should be plotted on cross-section rolls to facilitate computations. Quantities should then be summarized and entered in the ledger.

Quantities are to be computed to the nearest 0.01 acre and rounded off to the nearest 0.1 acre on the final estimate.

Reports

None.

202.00 SELECTIVE REMOVAL OF TREES OR STUMPS**General**

Each tree or stump to be removed should be plainly marked with flagging, paint, etc. Their location should be determined, ordinarily with reference to the roadway centerline, and recorded. It is best if all the trees and stumps to be removed are located and recorded in advance of the actual work and placed in summary form to become a part of the permanent project records. For purposes of documentation, the notes should include a description of the item, whether it is a tree or a stump and its diameter.

The inspector should document completion of this item of work as it is accomplished. Normally, there is less chance of error or duplication in reporting if only one inspector is responsible for this work.

Besides documenting removal, the inspector's records should indicate completion of subsidiary work, such as backfilling of stump holes and removal of trees and stumps of less than six inches in diameter. It is essential that the inspector count the trees and stumps prior to removal. Many times, projects, which have been several years in design, will have an overrun due to subsequent growth. The method of disposal shall be noted. When it can be readily determined that more than one tree is growing from a single stump, only one tree will be paid for.

The office man is responsible for recording and filing survey notes and may be required to develop a summary form for tree and stump removal. He is responsible for recording quantities of this item in the ledger for progress and final payment. The office man should be alerted to watch for duplicate reporting and also inform field personnel if he has reason to believe they have neglected reporting removal of a tree or stump shown on the survey notes or summary.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work. If a summary is prepared as described above, it shall also be considered a source document.

Quantities shall be computed and reported to the nearest whole unit.

Reports

None.

203.00 REMOVAL OF OBSTRUCTIONS**General**

Measurements should be taken and recorded in a notebook or summary sheet. Sketches may be needed to show dimensions. All notes should refer items to centerline, how far left or right, project number, date, and who measured by. Stakes or marks may be required to define areas of removal and where vertical sawing will be necessary.

The inspector is responsible to see that the measurements were taken prior to the time the items are to be removed. If trouble is anticipated on any item, photographs may be taken to supplement field measurements. These photographs should have written on the back "What, Where, When, and Why". The inspector must check periodically with the office man on pay quantities turned in to eliminate duplications. A monthly summary of items is normally sufficient. A checklist summarizing all items may be useful in cases where the items may be duplicated or overlooked.

On lump sum items, for work to be paid on the monthly estimate, the inspector should include in the last pertinent diary sheet (pay section) the percent of the item completed to date. His entry should state how this quantity was determined. When the work is completed during the month, an entry should be made in the ledger immediately following completion.

The office man shall check field notes for errors, stations, dates, and signatures. He shall be sure proper forms are used and that all items are documented, that all records are properly filed, and quantities are entered in the ledger promptly. He should notify the engineer of any errors in the records, documents missing, information needed, etc.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work. When used, summary sheets shall be considered source documents.

Pay quantities shall be computed and reported to the nearest whole unit.

Reports

None.

204.00 OBLITERATION OF OLD ROAD**General**

Quantities and locations of obliteration are normally noted on the plans. The survey crew should measure and enter the actual quantity and location of the work in a notebook or on a summary sheet. Small quantities can usually be measured and accounted for by the inspector. It may be necessary to do additional checking on items, such as removal of old pavement. Quantities may be provided, or the work could be considered incidental and the cost included in other items.

The inspector should report work completed in his diary and whether or not it is in accordance with staked quantities. Any deviation from original stakes should be accounted for. A summary sheet is useful for this purpose.

The office man enters the quantity as reported from the field in the field ledger.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work. When used, summary sheets shall be considered source documents.

Quantities shall be computed to the nearest 0.01 station and rounded off to the nearest 0.1 station on the estimates.

Reports

None.

205.00 EXCAVATION AND EMBANKMENT**General**

As much of the initial staking as is possible should be completed prior to the start of earth-moving operations. This will normally include staking centerline, reference points, benchmarks, clearing, right-of-way, and slopes. If the initial staking can be accomplished early, most errors and problems can be eliminated, thus reducing many of the pressures, which might otherwise be placed upon the instrument man. Good survey ties and references are essential.

Since field notes are the basic source document upon which pay quantities of excavation, borrow, etc. are based, care must be taken to see that they are complete, legible, and kept in an orderly manner. Cross-section notes for computer use should be made in duplicate, checked in the field, and turned in to the office as often as possible for further checking and filing. All field books should be plainly labeled and numbered and an index of field book numbers kept in the office. Any person not familiar with the project should be able to locate essential data easily. The engineer should make periodic checks to see that field notes are being properly kept. Remeasure of cuts or fills should be completed as rapidly as possible in order to arrive at a final quantity of excavation.

Review all stake-marking procedures with the contractor prior to construction so that misinterpretation of survey stakes can be avoided.

The accuracy of stakes set by the survey crew is the instrument man's responsibility. Checks should be made constantly to ensure that proper information is shown on the stakes; for example, run profiles over RP's, compare distances with right-of-way, etc.

The inspector in charge of grading should be certified in earthwork and be well experienced. His basic responsibility is to see that a compact roadbed is built in conformance with established lines, grades, and cross-sections upon which the base and surface courses can be constructed. His assistance must be certified in basic materials or trained on the job and temporarily certified by use of Form DH-1210-P, Basic Instructions and Limited Certification for Temporary Construction Employees.

A field lab should be located on the project and equipped with sufficient test apparatus and report forms to meet the pace of the earth-moving equipment. Orderly files should be kept in the field and include all lab reports, proctor curves, work papers, list of identification numbers, etc. It is the inspector's responsibility to see that sufficient tests and notes are taken to document compliance with compaction and other specifications.

Excavation Below Subgrade

Soft spots in the foundation which, because of a combination of soil type and moisture, will not compact to the required density must be excavated and backfilled with approved material in layers to meet compaction requirements before being accepted. Use of filter fabric should be considered to reduce the depth of subexcavation and also to provide stability to the subgrade.

Grade points require the same treatment as soft areas whether they show signs of failure or not. The amount to be excavated is confined between the shoulder slopes and as shown on the plans

or as far in to the cut as necessary to obtain sufficient compaction in the subgrade. Material removed may be stockpiled with topsoil if organic.

If excavated material needs to be wasted and there is neither a waste site specified nor is it reasonable or desirable to waste the material adjacent to the construction site, the Resident Engineer should secure a waste site and pay the contractor by change order a reasonable rate to dispose of the material at the designated site.

Care should be taken when making excavations that any pockets are drained toward the shoulders or natural drainage course and are backfilled with granular material to prevent trapping water under the roadway.

Measurement for excavation below subgrade should be made by the cubic yard in the original position. For small areas, the inspector should measure and record this information in his diary along with a sketch of the area. Large areas that are difficult to measure because of size or uneven floor should be cross-sectioned and computed by the end-area method.

It should be noted that all excavation below subgrade shall be referenced to the finished grade. For example, the plans will denote grade pointing by a note, such as "Grade Point 3.0 ft.". This note indicates that the depth of grade pointing will be 3.0 feet below finished grade.

Foundation Areas Requiring Special Treatment

Frequently, situations arise in areas that call for foundation compaction but where ground water or unsuitable materials make compaction impossible. The standard specifications permits end-dumping of granular material in swamp areas or in water to a depth not greater than necessary to support hauling equipment, after which the material shall be placed in layers and compacted.

Sand is one of the best materials to blanket soft, swampy areas. In end-dumping material across a swampy area, the depth of the lift should support the hauling equipment without movement. If movement in the fill is detected after the layer is started, move the operation back and ramp up to a greater layer depth. It is sometimes necessary to carry the first layer at subgrade elevation. Filter fabric should be considered in bridging swampy areas. The fabric will give stability and keep the underlying materials from mixing with the embankment material.

Embankment Construction

The specifications limit the loose layer depth for various types of materials before compaction. Layers should be placed in a uniform manner with special emphasis on the outer edges of the fill, especially regarding density and slope. A contractor may complain about not having sufficient bearing to support the equipment near the shoulders; however, this is no problem when compaction is carried out to the full shoulder width with each layer.

When shot rock is being used for embankment layer depths over eight inches, the layers should be regulated by the maximum size material, but in no case should they exceed three feet unless approved in writing. Rock should not be end-dumped over the embankment, but dumped short of the edge and pushed with a dozer in order to fill the larger voids with smaller material.

There must be a balance between hauling and compacting equipment to keep the work progressing satisfactorily. In case of failing tests, the contractor should be notified and

corrective measures taken. Areas which show failing tests shall have check tests which show acceptable densities or, in cases of replacement with granular material, what disposition was made in the area. The contractor should be encouraged to follow a systematic routing for compaction that will produce an acceptable and uniform result.

If, during the course of embankment construction, material is encountered which contains objectionable organic matter (such as logs, stumps etc.), special care should be taken to see that such refuse is removed from each layer before compacting. Also, no exception will be made, except in writing, for the incorporation of frozen material in the embankment.

In case soft areas result because of poor material or excessive moisture, corrective measures should be taken before allowing additional material to be placed over the area. In a case where undesirable material is concentrated, it will normally cause trouble; especially when trying to get 100% density in the top foot of embankment.

Special care must be taken when embankments are placed on existing slopes. Slopes steeper than 4:1 should be benched to bond foundation and embankment. Benches may vary in depth of cut form layer thickness to that necessary to provide equipment working room.

On projects involving borrow, granular borrow, or different schedules of excavation, it is the inspector's responsibility to identify and locate the various quantities of each item placed. Diaries, notebooks, and sketches can be utilized for this purpose. If profiles or cross-sections are required, measurements must be made prior to changes in material placement.

Cut and fill slopes must be constructed in reasonably close conformance to slope stakes. Periodic visual checks should be made by looking at the slopes in profile as they are being constructed. Any obvious "bellies" or undercuts should be corrected immediately. If not corrected, serious shortages or surpluses may result and the project cost increased accordingly. On large cuts and fills, this problem can involve several thousand yards and the cost of checking and restaking by the survey crew is minor compared with the cost of the material involved. Normally, good relations with the contractor's stakeman (who controls the construction of slopes by setting lath or stakes) will minimize problems with the slopes. It is good practice for the inspector to note in his diary; areas where the slope conforms to the stakes or where they do not.

Slope rounding of higher cuts should be performed during the pioneering, otherwise equipment will be unable to return to the top of the cut to remove the rounding material. All cuts except solid rock will be rounded to the extent necessary to prevent ragged appearance upon completion and comply with the plans.

Cuts in rock are normally designed with nearly vertical slopes. Ripping or blasting is usually necessary in order to reduce the material to a usable size. When jointing and bedding planes are not strong enough to withstand the forces applied during removal of the material, overbreak or shattering of material outside the neat lines of the slopes results. This loosened and shattered material must be removed to prevent its sliding into the roadway at some future date. The contractor should be encouraged to hold overbreak to a minimum.

In rock work, the inspector should check and note the contractor's drill hole spacing, hole depths, powder usage adjacent to slopes, blasting pattern, and any other information which could effect the stability of the finished slope. After completion of the work, it is sometimes difficult to reach an agreement with the contractor on whether the excess material removed is to

be classified as overbreak or slide because of the price differential. Good notes are required in this event.

Loose rock must be removed from the steeper slopes. The operation can be accomplished by hand or machine finishing methods. The contractor should be advised of the necessity for finishing or "scaling", as it is commonly called, during the early phase of the project. Results are usually more satisfactory if slopes are scaled as each lift of the cut is removed; however, the timing of the work is the contractor's choice. On flatter slopes, loose rock, which appears to be stable, need not be removed except as necessary to present a finished appearance.

Every effort must be made to scale and clean rock back slopes of as much loose material as possible. If an incomplete job is done on scaling, the remainder of the work will fall to the state maintenance forces.

Removal of slides is paid for at unit prices for excavation or as extra work according to the specifications. If during the progress of the work a slide is encountered or suspected, the district geologist should be consulted for proper corrective measures.

The specifications state, "No payment will be made for rock excavation made below subgrade elevations unless such excavation is required by the plans or directed. No allowance will be made for borrow replaced by unauthorized rock excavation below subgrade."

It is highly impractical to try to shoot a rock cut exactly to subgrade elevation. Redrilling is expensive; therefore, most contractors will drill "long" and overshoot the cut. Unless it is necessary to clear the cut to solid rock to remove objectionable material, the "shot rock" should be excavated as close as practical to subgrade elevation, allowing shot rock and spalls to fill any overshoot areas. Occasional rock points extending above subgrade is permissible, but these should not exceed one-half the depth of the untreated base material. Requiring the removal of overshoot material to remove objectionable material does not constitute authorization for payment for excavation below subgrade. However, if the objectionable material is encountered at this elevation, excavation should be authorized. Material used to backfill over-excavated cuts should be granular in nature. Granular borrow, excavation, or crushed gravel will be acceptable. Backfill will be paid for at the contract price for the material used. When using selected excavation for backfill, haul must be noted carefully to assure proper payment.

Finishing Subgrade

Extreme care should be taken, especially during finishing operations, regarding ditch grades and natural drainage outside the embankments. Water pockets along the finished roadway are unsightly and induce percolation under the roadway. Shaping ditches to drain after the grade is finished introduces the problem of either disposing of excess material or placing material in small quantities that requires special treatment in grading and compaction.

Areas that have been disturbed or roughened by equipment outside the roadway proper shall be reconditioned and left in an acceptable condition.

Occasionally contractors have requested that the subgrade surface be finished with a fine grade material to permit easier blading to a tight, smooth surface. Such requests should be carefully considered. In no case should a good granular or rocky subgrade be contaminated by addition of a weak or plastic soil on the top merely to expedite finishing.

Compaction Control

The term "compaction", as applied to highway construction, may be defined as "a measure of embankment and subgrade density".

Compaction is usually expressed as a percent of the laboratory determined, maximum, dry density for a given soil or mixture of soils. This laboratory determination will be discussed in detail below.

In order to obtain laboratory soil data necessary for ballast design, certain preliminary soils investigations must be made well in advance of contracting. The first of these is the soils survey.

Briefly, the soils survey is conducted by making a series of auger borings or test pits at intervals on and adjacent to the centerline of the proposed construction. Borings are made to a depth of three feet below subgrade. The investigator attempts to classify each soil encountered roughly according to its textural characteristics and to plot on the soils profile each soil layer or horizon by depth. Samples of these soil layers are submitted to the laboratory. This information is particularly useful to the inspector in running tests in cut sections and at points where finished grade corresponds to ground elevation. Examining the soils profile will aid in selecting the proper moisture-density curve.

Another important part of the preliminary soils investigations is the sampling of borrow pits. Test pits or auger borings are made as in the soils survey; but the samples submitted to the laboratory are usually composites of all the soil layers encountered unless, of course, a definitely undesirable soil type is found which will restrict the borrow excavation. Such soils should be placed well down in the embankment. The laboratory curves derived from these samples are valuable inasmuch as material removed from the borrow area during construction is often a mixture of several layers.

Such laboratory curves with their values for a maximum density and optimum moisture offer the greatest aid to the inspector in making field tests.

The inspector must first of all familiarize himself with embankment materials, which will be encountered on the job. This may be accomplished by studying all available laboratory curves, the soils profile, and (if necessary) by conducting further field investigations.

The attention the inspector gives to the actual placement of embankment and subgrade materials is one of his most important duties. He should watch the thickness of the lifts being placed. In many cases, it may not be practical to compact the maximum allowable loose thickness. Some soils do not mix readily with water, so it may be necessary to spread them into thinner lifts, wetting each, and then compacting. It is good practice to run the tamping roller over the lift prior to wetting to form pockets for and facilitate the distribution of water. More uniform moisture distribution may also be obtained by prewetting borrow pits and cut sections. Compaction is often aided and rolling time reduced by the proper routing of earth-moving and transportation equipment over the embankment. An effort should be made to see that such equipment does not always travel in the same "track" but rather varies its path over the full width of the grade on successive trips.

The inspector should encourage the contractor to obtain a proper "balance" of equipment. By this, it is meant the ratio between earth moving, compacting, and watering equipment. It is impossible to set an arbitrary ratio; for instance, one sheep's-foot unit and one water wagon for three scrapers. Too many variables are involved, such as haul distances for borrow and water, type of material being placed, natural moisture content, etc. This is a matter of judgment based on the results of compaction tests.

When no laboratory curve is found which will fit all the data from the field test, the inspector must "pound" out points on a curve of his own by following the same procedure used in the laboratory. Confusion sometimes results when a point is determined that will fit either of two laboratory curves. There may be several soil density curves of widespread soil type, which

could have a corresponding point for density and moisture. Choice of the proper curve is facilitated by adding an increment of water to the soil being tested and pounding out another point on the curve. Conversely, material from some other area can often be related to an existing curve by pounding two points rather than constructing a complete new curve.

The Proctor tests are the criteria, which govern compaction control. It cannot be emphasized too strongly the importance of making as many tests as possible. Watching the actual grading operations constantly is also an item of great importance. The inspector can, by using his knowledge and judgment, help to ensure satisfactory test results. While the procedure and calculations involved in compaction testing are relatively simple and may be mastered by almost anyone, the man who is chosen for the job of inspector should, of necessity, have some knowledge of construction grading operations. To facilitate testing and checking, the inspector and his equipment should move with the grading operations.

If a series of tests show a lack of proper compaction, the inspector should seek out the reason for the failure and suggest a remedy to the contractor. Under no circumstances should he assume the duties of the foreman. If the deficiency is serious or if a minor deficiency is not corrected within a reasonable length of time, work should be suspended and the inspector should notify the engineer immediately. Most deficiencies in compaction stem from a lack of water or a lack of rolling or both and may be easily remedied.

The duties of the inspector on compaction may be summed up in two primary objectives:

- A. To see that specification requirements for compaction are met and maintained.
- B. To obtain a uniformly compacted subgrade.

The latter consideration is important because the subgrade or top foot of cut and embankment carries the greater share of the ballast and traffic load. Nonuniform or insufficient compaction will result in differential settlement and subsequent deterioration of the roadway.

The office man has the responsibility of keeping the ledgers and source documents current and in good order. He may be required to check the DH-1115 report for mathematical accuracy. Field computations for quantities of Class "C" compaction, processing old road, excavation (miscellaneous) for example, must be checked in the office before final entries are made in the ledger.

Slope stake notes should be checked for possible staking errors. As soon as practical after starting staking, the notes should be forwarded to the computer section of the Information Systems and Data Processing Section for processing. Deviations from the typical section or standard slopes (for example, benched cuts, special ditches, etc.) should be indicated on the slope stake notes at the bottom of the form. The entire template from the centerline to the top of the slope may be listed if desired. A listing of the template used by the computer for comparison with natural ground may be requested if it is desired.

Particular attention is warranted by project personnel in setting up field notes for computer processing. Location of shots, format of notes, and the continuity of remeasure all contribute to rapid processing of field notes by the computer.

When remeasure cross-sections are required to determine overbreak, slide, or slope rounding quantities, etc., the notes should be checked and processed in the same fashion as slope stake notes. The remeasure cross-section can be compared with either the original ground or the template for determination of quantities by the computer. Plotting of cross-sections in the field office may be necessary in rough terrain in order to have a rapid check on quantities, balance points, changes, etc.; but this should be kept to a minimum.

Approaches, subexcavation, and minor quantities of miscellaneous excavation should be determined in the field office and, submission to the computer is not recommended. The final quantities of all the items under this section need to be submitted to the contractor as quickly as possible after completion of the item so that the final estimate will not be delayed unnecessarily.

Dust Abatement Water

Any water which the engineer or his representative orders the contractor to place for the purpose of controlling dust for safety and comfort of the traveling public, for the health and comfort of people residing near the project, or to protect crops which might be damaged from dust should be paid for.

It is not necessary that the engineer order the contractor to apply water for each occurrence of dust. He may instruct him to automatically place water under certain conditions as they arise, but the contractor must advise appropriate state personnel when such water will be applied so that necessary documentation of quantities can be made.

If it is obvious that dust abatement water is being wasted, appropriate quantities of water should be deducted after advising the contractor that such action will be taken.

Where a haul road is used exclusively by the contractor's equipment, the contractor will be required to abate dust at his expense, unless other considerations as indicated above are occurring.

Dust Oil

This is an oil material to be used in lieu of dust abatement water where such treatment would be more economical. Such situations could be graveled or dirt detours which would be used for an extended period of time; short detours a long way from the contractor's operations; or, under conditions of hot, windy weather, where it is difficult to keep enough water on a construction road to hold the dust down. It will be up to the engineer's judgment when to use dust oil or dust abatement water if both are set up in a project.

The Department intends to keep the air as clean as reasonably possible during construction operations. This will undoubtedly require more dust abatement water than has been used in the past. The Resident must be alert to dust conditions as they develop, order the necessary water to abate the nuisance, and pay the contractor for all such water used.

Verification of Plan Quantities

As soon as construction slope stakes are installed, the earthwork quantities should be calculated by sending staking notes to the Information Systems and Data Processing Section to check design quantities. Usually, this check run can be completed before the contractor starts work. If quantities vary a significant amount, the contractor should be notified of the quantity change by letter. The residency should make a new mass diagram using best available shrink-swell figures and make the new mass available to the contractor. On urban jobs, the plotted x-sections or three-dimension measurements on earthwork should be checked after the staking is done.

Documentation For Pay Quantity**A. Excavation, Channel Excavation, Borrow, and Granular Borrow**

Final pay quantities will be based on office computations and/or computer data. If the computer run is used as the source document, it should be spot-checked. This can be accomplished by selecting various x-sections and reconciling the elevations of both the x-sections and computer listings. It is not necessary to computer x-sections independently for comparison. This would only be a duplication of effort.

The computer run should also be reviewed for unusual sections, such as elevations and distances that are outside normal limits and O^O sections, and the plan quantity should be compared with the computer quantity. Changes and corrections should be listed and checked on the computer run. The final quantity should be summarized, checked, and listed on the last page.

In general, remeasure of excavation and embankment will not be required where the project was built in accordance with the slope stakes. A visual inspection of the slopes must be made to ascertain that they have been properly constructed. Acceptance will be documented by a diary entry. The slope stake notes will then be used to compute the final quantities. This procedure does not preclude the possibility of some special cases of remeasure when requested by the contractor or considered necessary by the Resident.

Three-dimensional measurements should be recorded for minor unstaked quantities. The reason for reverting to this method of measure must be explained in the diary.

Quantities for progress payments may be determined by using the contractor's daily load count. When possible, load count quantities should be verified by checking the quantities in an isolated cut. Estimated quantities should be frequently compared with plan quantities and any major discrepancies checked. The method used for obtaining quantities for progress estimates should be noted in the diary.

B. Class "C" Compaction and Process Old Road

Diaries or field notes should record measurements and stations of areas receiving Class "C" compaction. Calculation sheets are source documents. Diaries should document the activity.

Areas to receive Class "C" compaction are shown on the plans. Embankment foundations within four feet of finish grade are usually designated as areas to receive Class "C" compaction. If the area is rock or poor material is being bridged, Class "C" compaction may not be required. Judgment should be used to determine the locations which required Class "C" compaction.

C. Water for Dust Abatement

Tickets (DH-72) should be issued for all water intended for payment. Diaries should record placement, tank measurements, inspection to verify quantities, etc.

D. Reporting Quantities

The quantity of all excavation, borrow, and granular borrow shall be computed and reported to the nearest whole unit. The quantity of Class "C" compaction and

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"process old road" shall be computed to the nearest 0.01 of a unit and rounded off to the nearest 0.1 of a unit on the final estimate. The quantity of "water for dust abatement" shall be computed to the nearest 0.1 of a mg. and rounded off to the nearest whole unit on the final estimate.

Reports

Compaction tests shall be reported on Form DH-1115, Daily Compaction Report. Testing and reporting procedures are outlined in Idaho T-14 of the Field Test Manual. Test numbers shall run consecutively for compaction tests starting with test number one. Test numbers shall not be repeated.

206.00 HAUL**General**

Generally, very little survey is required for this item other than remeasure. Additional cross-sections or profiles may be required because of haul splits, balance points, or changes in material.

The inspector is responsible for recording the placement of material from each cut and borrow source. A notebook or diary is normally used. Quantities included on the monthly progress estimates will be documented by making references in the ledger to the method used to arrive at quantity. These quantities are normally estimated once per month or as required by the engineer. Accurate notes on haul are also essential when plotting the haul diagram at completion of the work. Handling of material should not be trusted to memory.

Any changes from plan designated haul ordered by the engineer or haul from approved source changes should be well-documented as to reasons for the change and to ensure the proper handling of the change on the haul diagram. Ballast requirements may also be affected if the split points are changed.

Close cooperation between inspector and survey crew will be necessary when major variations in materials require haul cross-sections or profiles of the work. For example, shot rock will normally swell in embankments as opposed to common material, which normally shrinks. Measurements are necessary in order to determine realistic shrink and swell factors on the haul diagram. The inspector should designate the areas for rock remeasure to the survey crew as soon as possible in order that no areas are overlooked.

Final quantities of haul will be determined by plotting a haul diagram or mass diagram in accordance with the specifications.

The diagram is based upon slope stake and final remeasure quantities. Plotting should be started as soon as earthwork data becomes available. Prompt processing of all slope stake and remeasure notes is most vital to the progress of the haul diagram. Too often, lack of attention to this detail delays the final estimate beyond a reasonable length of time.

Good, legible notes from the field are essential to the haul computations, and any shortcomings should be brought to the engineer's attention immediately. Cooperation between field and office personnel will avoid many problems. The use of methods involving calculated rather than measured areas in computing haul diagrams is recommended. This affords a computation for the checker to match.

In the event planned haul is revised at the State's request and there is no contract price for haul, additional costs on haul will be paid.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work. Original and final cross-sections and notes, computer printouts, and mass diagram shall be considered source documents for haul.

Quantities shall be computed and reported to the nearest whole unit.

CONTRACT ADMINISTRATION

Reports

None.

Haul

206.00

207.00 STRIPPING MATERIALS DEPOSITS**General**

Staking consists of designating baselines, benches, source boundaries, and area boundaries. Measurement is by the average end area method when the contract specifies stripping materials deposits by the cubic yard. Cross-sections should be established and recorded before and after stripping from a baseline that is referenced for horizontal and vertical reestablishment.

The standard specifications allow for measurement of stripping in its original position or in approved stockpiles. Since stripping may later be used for borrow or top soil, the stockpiles should not contain excessive vegetation or other foreign matter. However, this work is not considered as clearing and grubbing, which is not paid for on sources. Good construction practice would require that an attempt be made to consolidate the stockpile to a density matching the original in-place density. An understanding must be reached with the contractor as to what constitutes an approved stockpile prior to using this method.

The contract special provisions may specify that a certain area of the source is to be used or that a certain area is restricted or possibly that the stripping shall begin at a certain point and not exceed a specified slope. In these cases, or similar ones, it may be advisable to stake out the area involved.

When alternate deposits are requested by the contractor and approved, it will be at no additional cost to the state.

Diaries should document completion and acceptance of this work. All material not acceptable for incorporation into the finished product must be stripped regardless of whether payment is by the cubic yard or as an incidental cost.

The inspector must be familiar with the special provisions covering the material source and the material itself to ensure proper completion of the stripping item and compliance with specifications.

The inspector may be required to make estimates of stripping quantities for the purpose of documenting progress payments.

The office man normally is responsible for computing pay quantities of stripping, filing notes and computations, and entering estimated amounts for progress payments and final quantities in the field ledger.

Computer programs are available for reducing cross-section note information to quantities. One program measures the areas between the original and final cross-sections and requires original and final sections using the same baseline stations. The air mass program measures the difference in air volumes between the ground lines, before and after stripping, and a reference plane at an assumed elevation above the source. This program allows different baseline stations to be used before and after excavation; however, the outside limits of measurement must be the same. The air mass method is usually more accurate and convenient on rough, irregular sources.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work and should show estimated quantities. The original and final cross-section notes and computer printouts shall be considered as source documents.

Quantities shall be computed and reported to the nearest whole unit.

Reports

None.

208.00 INTERCEPTOR DITCHES**General**

Interceptor ditches must be carefully located if they are to serve their intended purpose of controlling drainage. They should be staked after the slopes limits are established. Low spots or pockets in the flow line should be avoided or drained when possible. Special treatment may be necessary to prevent excessive erosion in some soils. It may be necessary to contour or riprap excessive grades.

The inspector must check for conformity with stakes and plans and for workability of the design as grading progresses. Any necessary changes should be called to the engineer's attention immediately. Delay may make any changes very difficult and expensive.

Since most ditches are constructed off or near the edge of the right-of-way, the contractor should be informed of the construction limits and his responsibility for damage or trespass.

The inspector should prevent unnecessary damage to roadside vegetation.

The office man should post quantities in the ledger as the work is reported and check for errors in computation and documentation.

A summary sheet is very helpful in determining compliance with plans, omissions, or additions in staking and construction and duplication of quantities.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work and any changes. If quantities are remeasured, they may serve as source documents. Staking notes and summary sheets, when used, may be source documents.

Interceptor ditches shall be measured to the nearest foot and reported to the nearest 0.1 station on the final estimate.

Reports

None.

209.00 SMALL DITCHES**General**

Small ditches, by definition, are ditches involving an average of less than 20 cy. per station. This refers to the volume of the completed ditch. This limits the size of the ditch to an average end area of 5.4 square feet. It must be remembered that any excavation, borrow, or haul required to provide cuts or fills to carry small ditches will be paid for. Ditches larger than 20 cy. per station will not be paid for separately, but as the items required such as excavation, borrow, haul, etc.

Staking must be done carefully to ensure a satisfactory installation. The intended usage and required volumes must be considered and provided for. Stakes should be set for flow line, slopes on fills and cuts, and easement lines (if required). The layout should be reviewed in the field to be sure that the ditch will be satisfactory and that sufficient construction room is available without unnecessary waste of land.

Staking should be done, or at least considered, early in the project and thoroughly discussed with the contractor because of the effect the construction may have on irrigation and other items, such as minor structures, pipes, fencing, etc.

The inspector should be completely familiar with the required installation and its layout because of the exactness required to provide satisfactory results. Material for fill ditches must be carefully selected to provide an impervious ditch and prevent erosion. Foundations should be carefully prepared and embankment properly compacted to prevent future settlement and washouts. Slopes of fills and cuts are usually limited by right-of-way and/or construction easements, and the contractor must be advised of these limits. Trespassing without the owner's permission should not be allowed.

Soaking the ditch prior to full use will generally help prevent erosion. In some soils, it may be necessary to line the ditch with coarse gravel or other material to prevent washing. The inspector should recognize these situations and call them to the engineer's attention.

The office man should post quantities in the ledger as the work is reported complete. He should check to see that the source of the material and quantities of excavation, borrow, and haul are shown, when used.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work. The diary must contain enough information to assure proper payment for selective placement of material when required. Field books and summary sheets, when used, shall be considered source documents.

Small ditches will be measured and reported to the nearest foot.

Reports

None.

210.00 STRUCTURE EXCAVATION AND COMPACTING BACKFILL**General**

The survey crew is responsible for staking, recording grades and ground elevations, setting references, computing grades, and remeasuring. The crew must cooperate with the inspector and contractor in scheduling work.

The inspector checks the work for conformity with stakes and plans, notes any problems or revisions, and approves the foundation.

He should not revise pipe or structure locations without the concurrence of the engineer.

The inspector should carefully record reasons, depth, etc. on designating additional excavation below staked grade. He should not whether or not the contractor agrees with payment at contract prices for any additional depth. If the contractor does not agree with payment at contract prices for any additional depth, the engineer should be notified immediately and force account records kept for work on the additional excavation. The inspector should also check backfill for conformance with compaction specifications. He must report quantities of structural excavation, backfill, compacting backfill, concrete, etc. tot he office as they are complete. The inspector should verify original and final measurements on structure excavation prior to and during the work to ensure that proper notes are available for quantity computation.

Specific densities are required in compacting backfill; the record sampling crews have been instructed to check densities at structures as well as at other locations. Test results should be recorded on Form DH-1115, Daily Compaction Record.

The specifications require a 14-day waiting period before backfilling against newly constructed concrete structures. The engineer may waive this requirement provided that the concrete has been satisfactorily cured and finished and attained 80% of intended minimum strength. Minor structures may be excluded from such a waiting period or minimum strength requirement.

It should be noted that material to be placed behind abutments, retaining walls, and wing walls shall be of granular materials to allow thorough and effective drainage behind these structures. Reference: 501.06 and standard drawing.

It is permissible for the contractor to use regular roadway equipment for compacting around structures. This requires extra care but can produce satisfactory results when properly controlled. The limiting planes used in calculating quantities will be the same regardless of the type of equipment used.

The office man is responsible for posting quantities in ledgers, keeping field notes well organized as they are turned in, plotting and computing quantities where necessary, and filing all drawings and calculation sheets. He should follow up any detail that is not absolutely clear so that the final quantities may be accurately determined at an early date. It is sometimes very desirable to have the inspector covering structure excavation compute the quantities. A calculation book should be set up in advance of construction. Dimensions may be recorded in the diary during construction then transferred to the calculation book and all computations made on Form DH-404, Standard Computation Sheet. A sketch should be drawn for each individual portion of a major structure showing dimensions and elevations both before and after excavation.

Documentation For Pay Quantity

The diary shall be used to verify the activity, date, and location of the work and measurements. The calculation sheet shall be the source document for pay quantity.

Quantities shall be computed to 0.1 of a cubic yard and rounded off to the nearest whole cubic yard on each structure.

Reports

Compaction tests shall be reported on Form DH-1115, Daily Compaction Report. Test numbers shall run consecutively for compaction tests, starting with test number one. Test numbers shall not be repeated.

211.00 SOURCE RECLAMATION**General**

Source reclamation consists of grading and contouring material sources used for borrow or for the production of aggregates to a pleasing, natural appearing conformation, placing topsoil over the slopes and floor and seeding in accordance with the applicable sections of 621 - Seeding.

The inspector should make a careful review of the plans, special provisions and source plat before any work begins. Any proposed changes to the reclamation plan should be approved by the State Land Board.

Slopes steeper than that specified on the plans may present serious erosion and safety problems. It is, therefore, imperative that slopes be constructed as shown on the plans, which should allow vegetation to establish on the slopes.

Stockpiles of aggregates or overburden should not be left unless specifically shown on the plans.

Documentation For Pay Quantity

The diary shall be used to verify the work completed, the date, and the source number.

Reports

None.

212.00 WATER POLLUTION AND EROSION CONTROL**General**

At the preconstruction conference or prior to commencement of the applicable contract work, the contractor shall submit his plan of preventive measures for approval in accordance to Subsection 212 of the standard specifications.

Project personnel should be aware of potential soil erosion areas during the construction of the project and take steps to reduce or eliminate this problem. The condition of the project prior to winter shutdown can be the most important factor in reducing unnecessary erosion the following spring.

Trouble Areas and Possible Corrections

- A. Fill slopes left unprotected until curbs and embankment protectors are installed can be protected in some cases by a shoulder berm or combination ditch and berm. Water should be channeled to an area where less damage can occur.
- B. Interceptor ditches should be placed above cut slopes in problem areas at an early date.
- C. Steep haul roads can be cross-ditched at intervals when not in use.
- D. The specifications require partial seeding of projects that extend past one season.
- E. Transitions from cut to fill may require some placing of granular material or other methods to avoid erosion as water leaves the cut and follows a natural course along the toe of the fill.
- F. Temporary stream crossings should be constructed with granular material or be protected from erosion by riprap. Pipes through the crossing should be large enough to handle high water levels.
- G. Fine sand or silt on slopes subject to wind erosions should be covered with granular material or soil which is less susceptible to movement by wind.
- H. Avoid stripping more area than is necessary for removal of material from sources.
- I. All cross drains that can be placed should be complete prior to winter shutdown. Headwalls or aprons should be in place, if required, or acceptable channeling and diversion of water into the pipe should be required. Drainage channels into and away from pipes, and structures should be clear of debris.

Additional information on erosion and pollution controls can be obtained from the District Design Engineer.

Documentation For Pay Quantity

When items of work performed are covered under other sections, they shall be measured and documented as outlined in the appropriate section.

CONTRACT ADMINISTRATION**Water Pollution and Erosion Control****212.00**

Work not covered by other sections shall be paid for on a force-account basis in accordance with Subsection 109.03.

Reports

None.

213.00 TOPSOIL**General**

Topsoil consists of surface soil, which is capable of supporting vegetation. It should be reasonably free of weeds and debris.

Quality of topsoil will, of course, vary depending on its source. Only very high quality topsoil should be utilized for such purposes as irrigated planting beds and lawn construction. A lesser quality may be appropriate for rural highway slope seedbed construction. Any questions regarding suitability of topsoil for its intended use should be referred to the Construction Section, which will confer with the Transportation Vegetation and Landscape Manager.

Topsoil placement on slopes requires special treatment to avoid creep and erosion of the soil from the underlying base soil. The topsoil shall be keyed to the slope (if feasible) by harrowing, disking, or rolling. An ideal method, especially on steeper slopes, is to utilize the cleats of a crawler tractor run or winched up and down the slope.

Topsoil may be measured by the cubic yard in its original position or in temporary stockpiles. Topsoil measured by the square yard will be measured complete in place.

When topsoil is excavated from the roadway prism, it will be paid for as excavation in addition to payment as topsoil.

Documentation For Pay Quantity

Final pay quantities will be based on office computations and/or computer data from original and/or remeasured survey notes. (Refer to Section 205.)

Quantity of topsoil should be computed and reported to the nearest whole unit.

Reports

None.

214.00 ROADSIDE CLEANUP**General**

Roadside cleanup is intended to provide a means by which payment can be made to clean up debris from outside the clearing limits and the right-of-way line. Do not construe this to include debris cleanup covered by other items, such as 201 Clearing and Grubbing; 202 Removal of Trees and Stumps; 203 Removal of Obstructions; and 205 Excavation.

The removal of unsightly or hazardous items not covered by the above-mentioned items should be disposed of under this item.

Documentation For Pay Quantity

The diary should be used to verify the activity, date, and location of the work. DH-270A, B, and C weekly force account sheets should be used to document labor, equipment, and any materials needed.

Reports

None.